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Changing social categories in a changing society: Studying trends with correspondence analysis.

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This is an author-created version of an article originally published in *Quality & Quantity*, 44(3), April 2010, pp. 409-425 (published online first, 13 December 2008), for which copyright was transferred to Springer Science + Business Media B.V., Wednesday, November 26, 2008. The original publication is available at [www.springerlink.com](http://www.springerlink.com) (DOI 10.1007/s11135-008-9213-8), and in the printed version of the journal. Please refer to the original publication only.

A previous version of this paper was presented at the conference *Correspondence Analysis and Related Methods*, held at Erasmus University Rotterdam, Rotterdam, The Netherlands, June 25-27, 2007.

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Keywords: trend analysis, survey, correspondence analysis, composite correspondence analysis, multiple correspondence analysis, joint correspondence analysis.

### Abstract

Analytical strategies are discussed to study trends in data from repeated social survey research with correspondence analysis. By adding time to the contingency table, changing social categories can be studied over time with composite, multiple, or joint correspondence analysis. Doing so, one has to assume a stable society. By adding time twice, changing social categories can be studied in the context of their changing society. This last analytical strategy is illustrated with the case of the membership of Dutch broadcasting associations in changing Dutch society of the last decades (1979-2005).

## Changing social categories in a changing society: Studying trends with correspondence analysis.

When you want to characterize social categories through social survey research, you usually try to find out what social categories the respondents of the survey belong to. Additionally, you measure the relevant characteristics of the respondents and relate these to their social categories. With few relevant characteristics and few categories, this can easily be achieved with cross tables. As the number of variables or categories increases, however, it becomes increasingly difficult to get an overview of the relationships. In such cases correspondence analysis may help (Blasius & Greenacre, 2006; Greenacre, 1993; Murtagh, 2005). When one wants to characterize social categories over time through repeated social survey research, this is no different. Longitudinal data can be studied relatively easy with correspondence analysis (Bijleveld & Van der Burg, 1998; Deville & Saporta, 1983; Van der Heijden, 1987). However, studies of trends in the attributes (here, characteristics) of objects (here, social categories) are usually performed under the assumption of a stable, unchanging world (here, society) (cf. Doré & Ojasoo, 2001). In contrast, the present study tries to illustrate how the changing characteristics of social categories can be studied in the context of a changing instead of a stable society.

### Properties of the contingency table to analyze

Cross tables or contingency tables that are analyzed in correspondence analysis vary from simple two-way tables to much more complex, concatenated tables. In this section, a number of these contingency tables will be discussed in order to explain a specific kind of table, that you can analyze to describe changing social categories in a changing society.

Examples of the most simple contingency tables are shown in Figure 1. To the left in Figure 1 a cross table is displayed that has four social categories as rows (e.g., people with a

preference for John, Paul, George, or Ringo, respectively), and two characteristics as columns (e.g., male and female). To the right, a cross table is shown in which the same four social categories are related to three other characteristics (e.g., living in Liverpool, Scotland, or elsewhere in the UK). Such tables can be analyzed with simple correspondence analysis (Blasius & Greenacre, 2006; Greenacre, 1993; Murtagh, 2005).

[Insert Figure 1 about here]

Now suppose that we want to characterize the fans of John, Paul, George, and Ringo with a combination of their gender and place of residence. In that case the two cross tables have to be combined into one table as input for our analysis. This can be done in two different ways, that are shown in Figure 2. On the left, the two tables are concatenated over the columns. In the resulting contingency table, all the bivariate relationships of the variables gender and place of residence with preference for one of the Beatles are contained. Correspondence analysis of such a table is often referred to as composite correspondence analysis. The table on the right is a three-way table that contains the multivariate relationship of the variables, gender, place of residence, and preference for one of the Beatles. When such a table is analyzed with correspondence analysis, the analysis is usually referred to as multiple or joint correspondence analysis (Greenacre, 1993, 2006).

[Insert Figure 2 about here]

The right table in Figure 2, however cannot be analyzed as such with multiple or joint correspondence analysis. It has to be flattened first, because with multiple or joint correspondence analysis one can only analyze two-way tables (Greenacre, 1993; Van der Heijden, 1987). Flattening the right table in Figure 2 is possible in two highly related ways,

that are depicted in Figure 3. On the left the indicator matrix ( $Z$ ) is shown. For every respondent in the data matrix the social category (preference for John, Paul, George, or Ringo) and categories of the other variables (gender, and place of residence) that they belong to are indicated with a one. All other categories are indicated with a zero. All relationships in the three-way table in Figure 2 are present in this indicator matrix. This indicator matrix may serve as input for correspondence analysis, which is then referred to as homogeneity analysis or multiple correspondence analysis (Greenacre, 1993, 2006). On the right hand side of Figure 3, a Burt matrix is shown, which consists of all two-way cross-tabulations of the variables in the three-way table on the right side of Figure 2, including the cross-tabulations of every variable with itself (only the diagonal elements of these cross tables of variables with themselves are non-zero). This Burt matrix can be obtained by multiplying the transpose of the indicator matrix with the indicator matrix itself. When this matrix is analyzed with correspondence analysis, the results are equivalent to the results from analyzing the indicator matrix; thus it is also called multiple correspondence analysis (Greenacre, 1993). When the Burt matrix is analyzed in such a way that the diagonal blocks are taken out, it is called joint correspondence analysis (Greenacre, 1988, 1993, 2006).

[Insert Figure 3 about here]

When characterizing social categories with such tables as shown in Figures 2 and 3, two analytical strategies are appropriate; (1) composite correspondence analysis with the social categories as row variable(s) and the characteristics as column variables, or (2) multiple or joint correspondence analysis of all the characteristics with the social categories as supplementary rows concatenated to the Burt matrix (cf. Greenacre & Pardo, 2006, p. 199). The contingency table to analyze with the second analytical strategy, is displayed in Figure 4. The upper half of that table consists of the Burt matrix of the characteristics of the social

categories, without the social categories themselves (active rows). The bottom half of the table consists of all two-way cross-tabulations of the social categories with the characteristics (passive rows) (Greenacre, 2006). The first analytical strategy comprises of a straightforward analysis of all bivariate relationships of the social categories with their characteristics. The second strategy entails an analysis of all relationships between the characteristics and then using this knowledge to describe the social categories. For example, if you studied the relationship between place of residence and gender and found that most of the inhabitants of Scotland were female, you could try to use this knowledge to describe the preference for one of the Beatles.

[Insert Figure 4 about here]

Now suppose that you want to characterize the fans of John, Paul, George, and Ringo over time. That is, you want to characterize social categories at different points in time, through repeated social survey research. In that case you have to assume that the characteristics as such do not change. Males are always males, even if they occasionally dress up like females, and inhabitants of Scotland inhabit Scotland, even if they have just moved there. Otherwise you would not be able to measure the characteristics reliably and validly. But assuming that the characteristics as such do not change does not mean that the characteristics may not apply differently over time. For instance, mass male migration to Scotland might occur, because of the female surplus in that part of the United Kingdom, and thus these migrant males would become inhabitants of Scotland, changing their characteristics over time.

To study changing social categories over time, you have to add time to the contingency table you want to analyze. How to do that, however, depends on the analytical strategy you choose. The two analytical strategies mentioned earlier may also be pursued

when analyzing changes over time,<sup>1</sup> but a third analytical strategy can be added; (3) multiple or joint correspondence analysis of all the characteristics and time, with the social categories as supplementary rows concatenated to the Burt matrix. For all three strategies I will discuss how to add time to the table.

[Insert Figure 5 about here]

For the first analytical strategy (composite correspondence analysis), Figure 5 indicates how to add time to the contingency table. On the left, time is added as an extra layer behind the original table. Van der Kamp and Bijleveld (1998) would probably call the resulting table a “social categories, variables, occasions data box”. On the right a LONG matrix is displayed that can be constructed by concatenating the time layers over the rows. Analyzing this matrix enables you to describe changing social categories over time, but “framed conceptually, analyzing the LONG matrix, one [...] models changing [social categories] in a stable world” (Bijleveld & Van der Burg, 1998, p. 88). Changing social categories cannot be analyzed in the context of a changing society with this analytical strategy. For instance, when mass male migration to Scotland has taken place between social surveys at T1 and T2, one might conclude from the analysis that Paul's popularity has diminished among the inhabitants of Scotland between the two social surveys. You would not see in your results that this change might be due to north bound mass migration and you might even miss out on it completely, coming up with some pretty far fetched explanations for Paul's plummeting popularity in Scotland.

The second analytical strategy (multiple or joint correspondence analysis of the characteristics with the social categories as supplementary variable(s)) requires the addition of time to the indicator matrix as illustrated on the left hand side of Figure 6. There you see a “persons, variables, occasions data box” (Van der Kamp & Bijleveld, 1998) that is highly



incomplete. The respondents of a survey at a particular point in time have missing scores at the other points in time. This has consequences for the flattening of this three-way table to a two-way LONG matrix. To make changes in the characteristics of the social categories visible in the analysis, the social categories at the different points in time have to be kept apart (cf. Doré & Ojasoo, 2001), and thus a lot of zero-cells appear in the LONG indicator matrix constructed through concatenating the time layers over the rows.

[Insert Figure 6 about here]

The result that you see on the right hand side in Figure 6 consists of two sub-matrices; on the left you see the supplementary, or passive columns (denoted as  $Z^*$ ), whereas the columns on the right are active columns (denoted as  $Z$ ). With these two sub-matrices you can construct the LONG Burt matrix that is analyzed in this second analytical strategy (see Figure 7). Analyzing the LONG Burt matrix results in a map that depicts the social categories at different points in time at different points in the map. Like the first analytical strategy, however, this strategy does not reveal changes in society at large; the association between living in Scotland and T2, and living in Liverpool or elsewhere in the UK at T1 would be invisible. Thus, with this strategy it is not possible to study changing social categories in the context of a changing society.

[Insert Figure 7 about here]

With the third analytical strategy (multiple or joint correspondence analysis of the characteristics and time with the social categories as supplementary variable(s)), on the other hand, that is possible. When pursuing the third analytical strategy, adding time to the indicator matrix is performed exactly as with the second strategy (see left of Figure 6). The

translation to a LONG indicator matrix, however differs. For every point in time (social survey), an active column is added to the LONG indicator matrix on the right in Figure 6 (see the left of Figure 8). Together these extra columns indicate in which social survey the data for every respondent were collected (cf. Doré & Ojasoo, 2001). The corresponding Burt matrix is displayed at the right hand side of Figure 8.

[Insert Figure 8 about here]

In fact, time is added twice to the matrices in Figure 8. When you analyze the double-time LONG indicator or Burt matrix with multiple or joint correspondence analysis, you can observe changes in the population as a whole over time, due to the added time columns. Simultaneously, you can see how the social categories change over time because the social categories are entered for every point in time separately. Thus changing social categories can be studied in a changing society.

### Example study

In real life, of course, we are not very much interested in John, Paul, George, and Ringo anymore; let alone imaginary mass male migration to Scotland. Thus, to illustrate the third analytical strategy, we analyzed real Dutch data in which the membership of broadcasting associations is studied over time. The Dutch broadcasting system consists of public and private television and radio stations. On television, seven commercial channels and three public channels are catering to the general public. The public channels have a market share of about one third. Ten broadcasting associations have a license to broadcast on the three public channels. These broadcasting associations are required to have members and represent various religious, ideological, and other social categories. For instance, the KRO is a Catholic broadcasting association, the NCRV a protestant, and the VARA a socialist

broadcasting association. They have to broadcast programs that make the voice of these social categories heard on television and radio. Together the broadcasting associations should safeguard that differentiated minority perspectives get on the air.

But what are these perspectives? Religion is slowly loosing its foothold in Dutch society. Increasing numbers of people stop going to church and do not believe in God anymore. Values change, people are becoming less traditional, and less conservative (Becker & De Hart, 2006; Becker & De Wit, 2000; Becker & Vink, 1994; Dekker, De Hart & Peters, 1997; Felling, 2004; Lechner, 1996). Dutch society is in a state of flux. But how does this affect the membership of the broadcasting associations? Are the members of the broadcasting associations changing in the same way as society around them, or do they follow different paths? To find that out we study the changing beliefs, values, ideologies, et cetera of the membership of the broadcasting associations. After all, if the membership changes its colors, maybe the broadcasting associations should change their colors too.

### *Data*

We use data from a series of six representative national social surveys that were held in the Netherlands between 1979 and 2005 by name of *Social and Cultural Developments in the Netherlands* (Eisinga, Coenders, Felling, Te Grotenhuis, Oomens & Scheepers, 2002; Eisinga, Felling, Konig, Peters & Scheepers, 1999; Eisinga, Felling, Peters & Scheepers, 1992). The number of complete cases for our analysis varies from the minimum of 829 in 2000, to the maximum of 2,102 in 1990. Thus we need to weigh the data to prevent that some surveys dominate our solution while others are being bogged down. To that end we divided all elements of the persons, variables, occasions data box by the number of complete cases in the survey they stemmed from.<sup>2</sup>

The variables with which we characterized the membership of the broadcasting associations were adherence to traditional achievement values, traditional family values,

social criticism, and hedonism (all Likert scales); subscription to a Christian worldview, subscription to an immanent worldview, denial of the meaning of life, and denial of the meaning of sorrow, suffering, and death (all Likert scales); salience of one's religious or non-religious worldview (Likert scale); church membership (Catholic, Protestant, other Christian church, not a church member); opposition to a tougher trade union policy, and opposition to income and status equalization (both Likert scales); favoring of restriction of civil liberties and rejection of intervention in matters life and death (both probabilistic scalograms); a traditional view on women (Likert scale); political orientation to the left or right (left, middle, right); and years of age.<sup>3</sup>

Since most of the characteristics were measured with scales of presumed interval level, we used fuzzy coding (Murtagh, 2005) to transform all variables except the nominal variables (church and broadcasting association membership) to categorical variables in a linear fashion. That is, we replaced each variable with two stand-in variables; one for each end of the scale. To that end, we calculated the length of the range of values of the scale, the minimum value, and the maximum value of the scale. Subsequently, the stand-in variable for the lower end of the scale was calculated as the maximum minus the actual value, which was then divided by the length of the range. The stand-in variable for the higher end of the scale was calculated as the actual value minus the minimum, which was then also divided by the length of the range. This way the scores of the two stand-in variables vary between zero and one, add up to one for every respondent, and indicate how far or close the value of the original variable was removed from the two extremes of the scale.

### *Joint correspondence analysis*

The double-time LONG Burt matrix of the above data was analyzed with joint correspondence analysis (Greenacre, 1988, 1993, 2006). Time was included as six active rows and columns, and the broadcasting associations were included in the analysis as passive

rows for every of the six points in time. The matrix was analyzed with the use of the R package (R Development Core Team, 2007) CA by Nenadić and Greenacre (2006).<sup>4</sup> In three dimensions 90.6% of the inertia was depicted. The cloud of points resembles a long sausage. The first dimension is clearly the most important dimension. Most points are well represented in the first dimension. However, some points are not well accounted for in this first dimension, as can be seen in Table 1, in which the relative contributions of the dimensions to the inertia of the points are listed. Traditional achievement values are not well represented in the first two dimensions. They are mostly represented in the third dimension. Social criticism, and opposition to income and status equalization are best represented in the second dimension. Salience of one's religious or non-religious worldview is best represented in a combination of the first and third dimension, and opposition to a tougher trade union policy is best represented in a combination of the second and first dimension. Thus we did not restrict our solution to one dimension, but calculated a three-dimensional solution. For all points except 1985 at least half the inertia is accounted for in three dimensions.

[Insert Table 1 about here]

First we plot the active variables and interpret the result. Afterwards we will concentrate on the passive variables. That is, first we will study the changes in Dutch society, and afterwards, we will see how the membership of the broadcasting associations has changed over time in the context of the changing Dutch society.

### *Changes in Dutch society*

Figure 9 displays the first dimension vertically (2nd horizontally). The high ends of the fuzzy-coded scales in this figure are marked with big labels, and the low ends of these scales are marked with small labels. Interpretation is straightforward. Time advances from the

top to the bottom of the figure. Keeping in mind that traditional achievement values, social criticism, and opposition to income and status equalization are not well accounted for by the first dimension, the first dimension can be interpreted as representing the process of individualization. One aspect of individualization is de-institutionalization (Felling, 2004; Peters & Scheepers, 2000). De-institutionalization comprises of a mitigation of traditional ties that bind people to institutions like the church. In Figure 9 this is exemplified by the church members near the top of the figure and the people who are not a member of a church near the bottom. A further aspect of individualization is de-traditionalization (Felling, 2004; Peters & Scheepers, 2000), which can be recognized in Figure 9 as the top-down erosion of the Christian worldview and strengthening of an immanent worldview. The shrinking subscription to a traditional view on women and traditional family values, the diminishing support for restriction of civil liberties, and the decreasing rejection of interventions in matters of life and death also indicate this trend of de-traditionalization. The increasing denial of the meaning of life, sorrow, suffering, and death points in this direction too. A last aspect of individualization is fragmentation (Felling, 2004; Peters & Scheepers, 2000). This means that people's worldviews become less and less important for their everyday life, and it can be recognized in the figure as the waning salience of people's religious or non-religious worldview. In short, the most important trend we see in our data is the tend of individualization.

All in all, It appears that the tends in Dutch society, as described in Felling, Peters, and Scheepers (2000) up till 1995, have continued. Individualization of Dutch society has progressed further after 1995. The somewhat lesser pace of the process between 1990 and 1995, that was observed and interpreted as a leveling of the process by Peters, Felling, and Scheepers (2000), can now be interpreted as a temporary lull. The storm still rages.

[Insert Figure 9 about here]

Perpendicular to the first dimension, Figure 10 shows the second (horizontal) and third (vertical) dimensions on a scale ten times as large as the scale of Figure 9. Thus, the changes in Dutch society depicted in Figure 10 are much less important than the changes shown in Figure 9. They are nevertheless interesting. The second dimension seems largely determined by opposition to income and status equalization on the left and social criticism on the right. To a lesser extent this dimension is defined by opposition to a tougher trade union policy on the left, and a leftist political orientation on the right of the figure. The overall impression thus arises that more to the right in the plot, people put more emphasis on equality and solidarity. This seems to correspond to the position of a Christian worldview on the second dimension. After all, Christianity preaches compassion and love for one's fellow human beings (Konig & Van der Slik, 2004). According to Felling (2004) and Peters and Scheepers (2000) less emphasis on equality and solidarity is part of de-traditionalization, but our analysis renders this implausible. Opposition to income and status equalization and social criticism are not well accounted for by the individualization dimension (dimension 1) that encompasses de-traditionalization. Further, time does not correlate linearly with the second dimension. The trend seems to change around in 1990. From 1979 to 1990, society seems to move away from emphasis on equality and solidarity, but since then increasing emphasis on equality and solidarity can be observed. This trend is in line with Scheepers, Peters, and Felling (2000, p. 153), who conclude that until the beginning of the 1990's, opposition to income and status equalization was on the rise, but that this trend stopped in the early 1990's. We now can see that the trend has reversed since then.

[Insert Figure 10 about here]

Traditional achievement values are best represented in the third dimension. These values stress getting on in life, practicing one's occupation, being in a good financial situation, and social security; which indicates a fairly individualistic approach to economic life. On the other hand, these values are fairly traditional in Dutch society, so subscribing to traditional achievement values can hardly implicate de-traditionalization (Felling, 2004; Peters & Felling, 2000). Other points in the plot that characterize the third dimension are membership of the Catholic versus Protestant and other Christian churches. Also, the salience of people's worldview, the attitude towards restriction of civil liberties, and not subscribing to an immanent worldview contribute to the third dimension. Together, these points in the plot suggest that the third dimension contrasts pragmatism at the top with idealism at the bottom. People near the top of the figure pragmatically cope with the world as it presents itself to them. They resign themselves to the world in which they live, without letting their beliefs and principles lead them far from their path in this world. Near the bottom people are more inclined to let themselves be guided by their beliefs and principles. They cope with the world much more consistently and militantly. Traditions do not necessarily have to be maintained; if need be, the world may have to be changed. For example, even if a restriction of civil liberties may seem to be the practical thing to do, they might still not jettison their principles and restrict civil liberties. This idealism seems to be losing ground to pragmatism over time; although not in a linear fashion.

### *Changes in membership broadcasting associations*

Now that the changes in Dutch society have been explored, we can explore how the membership of the broadcasting associations has changed over time in the context of the changing Dutch society. Figure 11 shows the broadcasting associations over the years on the



first two dimensions. After a ninety degree rotation, this figure can be superimposed on Figure 9, save for a scale transformation. That means that the interpretation of the dimensions is the same as in Figure 9. The points are again clustered as a sausage around the first dimension. Therefore, again, only the first dimension in Figure 11 is interpreted. To simplify that interpretation, the labels are not printed immediately next to the points, but a bit further away and sorted for every broadcasting association. For example, the leftmost point is the point for the EO (an evangelical broadcasting association) in 1979. Its label can be found perpendicular to the horizontal axis above the point itself. As a consequence, it is easy to see how great individualization has made inroads into the membership of each broadcasting association. To further simplify interpretation, a horizontal bar is drawn behind the labels; the length of which indicates the distance between the extreme positions through time for every broadcasting association.

[Insert Figure 11 about here]

From Figure 11 one can conclude that the members of EO and NCRV are least individualized. These broadcasting associations are Protestant broadcasting associations. At the other side of the spectrum, the members of VARA, VPRO and BNN are the most individualized. These broadcasting associations cater to the socialists, intellectuals, and young, respectively. The middle ground is occupied by the members of neutral (neither religious, nor socialist or intellectual) broadcasting associations (AVRO and TROS), and the non-members. The Catholic broadcasting association KRO bridges the gap between the Protestant and neutral broadcasting associations. Veronica,<sup>5</sup> a broadcasting association for the young, bridges the gap between the neutral and the socialist broadcasting associations. Max, a broadcasting association targeted at the old, also bridges this gap. Thus, the whole spectrum

is covered by the memberships of the broadcasting associations; from hardly individualized to highly individualized.

As to changes over time, some interesting observations can be made. It seems that the membership of every broadcasting association has become more individualized; not always in a linear fashion, but the end effect is a considerable individualization. That is in line with the change in Dutch society at large. There is one exception; BNN. The membership of that broadcasting association has become less individualized between 2000 and 2005. However, this can hardly be called a trend, since BNN is a relatively new broadcasting association that was only represented in the last two surveys.

At least as interesting is the fact that the membership of NCRV and KRO, two religious broadcasting associations, was strongest subjected to the process of individualization. De-institutionalization and de-traditionalization have eroded the religious nature of the membership of these two broadcasting associations. The members of the Protestant NCRV are still more religious than the members of the neutral broadcasting associations, but with respect to religion, the membership of the Catholic KRO hardly differs from the members of AVRO and TROS anymore.

[Insert Figure 12 about here]

The varying pace of individualization of the members of broadcasting associations and the non-linearity of the process for some broadcasting associations, raises the question as to whether or not the multiformity of the public broadcasting system has changed over the years. That can be read from Figure 11 too. If you project the points for every broadcasting association in a specific year on the horizontal axis, you can measure the distance between the points that lie furthest apart. If you do that for every year, the years can be compared. The result of this exercise is displayed in Figure 12. From that figure you can conclude that after an

initial drop between 1979 and 1985, the multiformity as to individualization of the memberships of the broadcasting associations did not vary much anymore. The only exception is the year 2000, in which BNN figured in our analysis for the first time. Without BNN, there would not have been much difference between 2000 and the other years. In 2000, the membership of BNN was the most individualized of all broadcasting associations. Five years later, however, the membership of BNN had become less individualized. Thus one can conclude that after 1985, the multiformity of the Dutch public broadcasting system as to individualization has not shrunk. At the same time, the new broadcasting associations BNN and Max have not permanently added to the multiformity as to individualization either.

[Insert Figure 13 about here]

Individualization is the most important trend in the membership of the broadcasting associations. They change at different paces and different levels, but it is clear from our analysis that no broadcasting association is immune to the individualization trend in society at large. Less important changes can be observed in the second and third dimension of our joint correspondence analysis (see Figure 13). Here too, the broadcasting associations follow the general trend in society. At first the membership of all broadcasting associations put less emphasis on equality and solidarity, but later this process reversed and in 2005 they all put more emphasis on equality and solidarity than they did in 1979. Over the years, on this dimension, the broadcasting associations have become more similar to each other. In this respect, the multiformity of the Dutch public broadcasting system has become less. This holds true for the third dimension, too. The vertical distance between the the tails of the arrows (mostly corresponding to 1979) in Figure 13 is larger, than the vertical distance between the heads of the arrows (corresponding to 2005). The membership of broadcasting associations that started out more idealistically in 1979 changed more in the direction of pragmatism, than

the membership of broadcasting associations that were more pragmatic to begin with. Exception to this rule are the evangelical Protestant broadcasting association EO, which changed relatively little for an idealistic broadcasting association, and the broadcasting association for the young BNN, that changed considerably in the five years between 2000 and 2005.

## Discussion

In this study we showed that Dutch society has changed considerably over the past decades. Individualization has pushed its way through the undergrowth of institutions and traditions in the forest of Dutch religion, conservatism, and values – clearing the path for every individual Dutchman and Dutchwoman to wander through this forest in the direction of his or her choice, at his or her own volition. The undergrowth, once keeping the forest together has lost much of its importance for the Dutch. Next to individualization, Dutch society also changed with respect to the emphasis put on equality and solidarity. At first less emphasis was put on equality and solidarity, but this process changed to full reverse later on. The last change in Dutch society that we unearthed is a shift from idealism to pragmatism.

In the context of this changing society, the membership of the public broadcasting associations changed at different paces and levels in all three dimensions. The net effect of these changes is that in 2005, the membership of the different broadcasting associations have become more alike than in 1979. The differences between the memberships of the broadcasting associations, however, are still bigger than the changes that have taken place over the years.

With our example study on the membership of Dutch broadcasting associations we showed that with joint or multiple correspondence analysis of a double-time LONG Burt matrix, it is possible to study changes in social categories in the context of a changing society.

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Footnotes

<sup>1</sup> Of course, more analytical strategies are possible. Müller-Schneider (1994), for instance, proposes something quite similar to the first strategy, but with data of only one survey as active rows and the data from the other surveys as passive rows.

<sup>2</sup> In fact, this weighting procedure was not carried out until after the fuzzy coding that is discussed below.

<sup>3</sup> Details on the measurement and psychometric characteristics of these measurement instruments will be sent on request.

<sup>4</sup> This package had to be modified slightly to enable the input of an indicator matrix instead of a response pattern matrix. This was necessary because we used fuzzy coding. The modified version of the CA package will be sent on request.

<sup>5</sup> In 1995, Veronica ceased to be a public broadcasting association and became a commercial channel. However, the magazine that came with membership of Veronica continued to exist. Thus people could remain a member of Veronica – many did – and therefore the 1995 and later surveys also measured membership of Veronica, despite the fact that Veronica ceased to be a public broadcasting association.

## Tables and figures

Table 1

*Quality of representation of active points in three dimensions (relative contributions  $\times 1000$ )*

	total	dim 1	dim 2	dim 3
1979	755	723	1	30
1985	386	337	40	9
1990	619	44	530	44
1995	546	384	153	8
2000	679	616	4	58
2005	626	489	109	29
Traditional achievement values (+)	783	4	178	600
Traditional achievement values (-)	783	4	178	600
Traditional family values (+)	960	655	123	182
Traditional family values (-)	960	655	123	182
Social criticism (+)	965	204	741	20
Social criticism (-)	965	204	741	20
Hedonism (+)	811	630	62	120
Hedonism (-)	811	630	62	120
Christian worldview (+)	991	972	16	2
Christian worldview (-)	991	972	16	2
Denial of the meaning of life (+)	616	605	8	4
Denial of the meaning of life (-)	616	605	8	4
Immanent worldview (+)	951	855	17	79
Immanent worldview (-)	951	855	17	79
Denial of meaning of sorrow, suffering, and death (+)	945	914	2	29
Denial of meaning of sorrow, suffering, and death (-)	945	914	2	29
Salience of (non-)religious worldview (+)	684	429	25	230
Salience of (non-)religious worldview (-)	684	429	25	230
Opposition to a tougher trade union policy (+)	889	310	577	3
Opposition to a tougher trade union policy (-)	889	310	577	3
Opposition to income and status equalization (+)	942	89	724	129
Opposition to income and status equalization (-)	942	89	724	129
Restriction of civil liberties (+)	964	884	1	79
Restriction of civil liberties (-)	964	884	1	79
Rejection of intervention in matters life and death (+)	974	972	1	1
Rejection of intervention in matters life and death (-)	974	972	1	1
Traditional view on women (+)	844	725	17	103
Traditional view on women (-)	844	725	17	103
Political orientation to the left	982	794	82	106
Political orientation to the right	982	794	82	106
Member of Catholic church	833	624	35	175
Member of Protestant church	990	976	1	14
Member of other Christian church	816	786	1	29
Not a church member	981	974	3	4
Age: old	531	300	134	97
Age: young	531	300	134	97

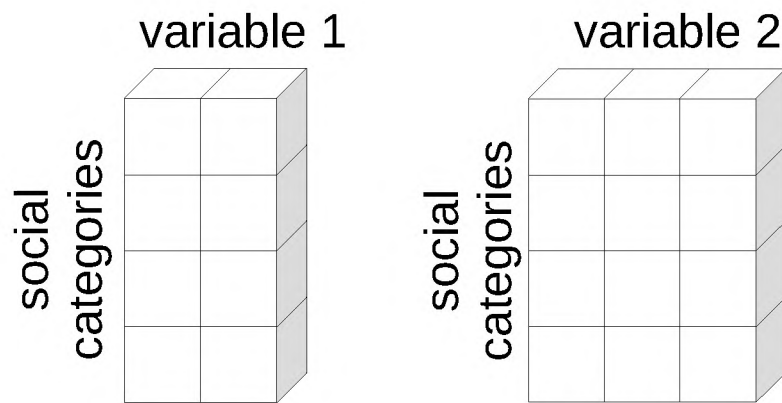


Figure 1: Simple contingency tables

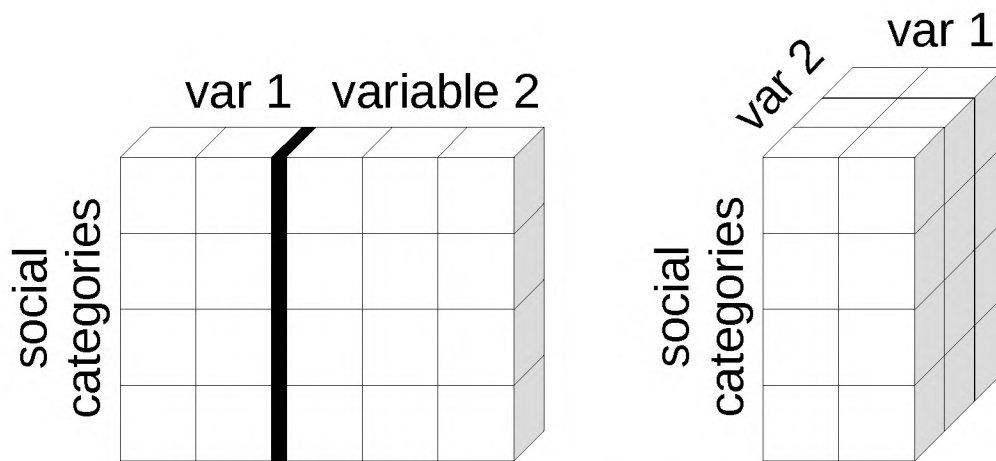


Figure 2: Combining simple contingency tables

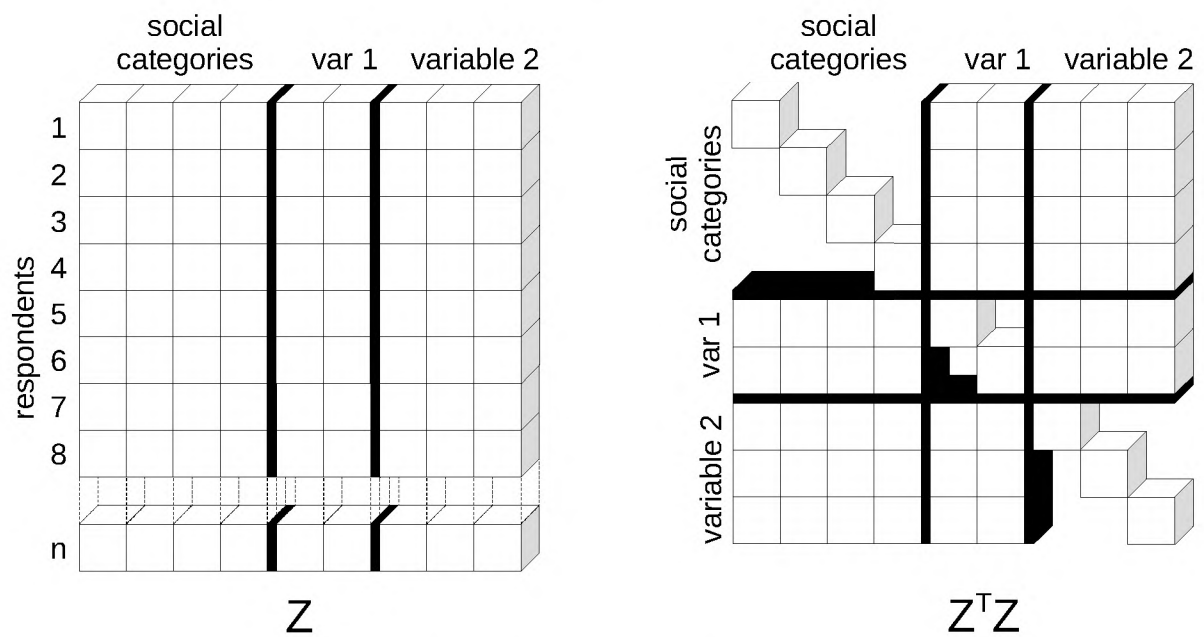


Figure 3: Indicator and Burt matrix

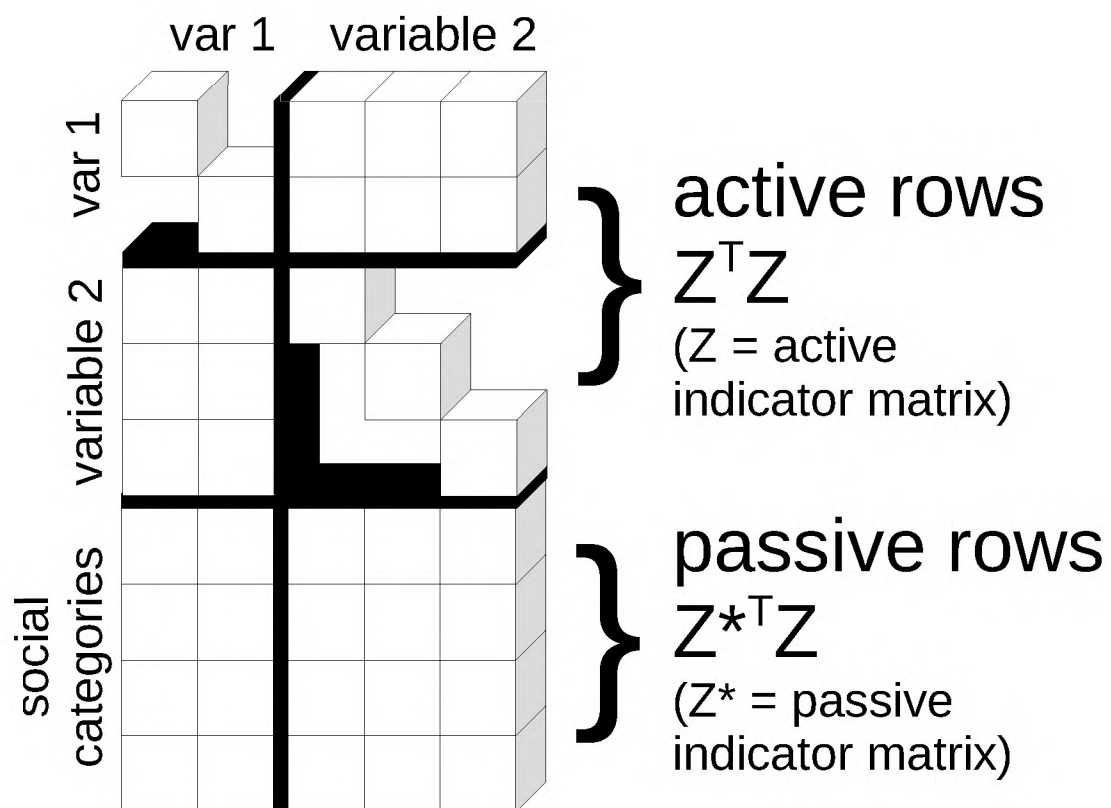


Figure 4: Burt matrix with supplementary rows

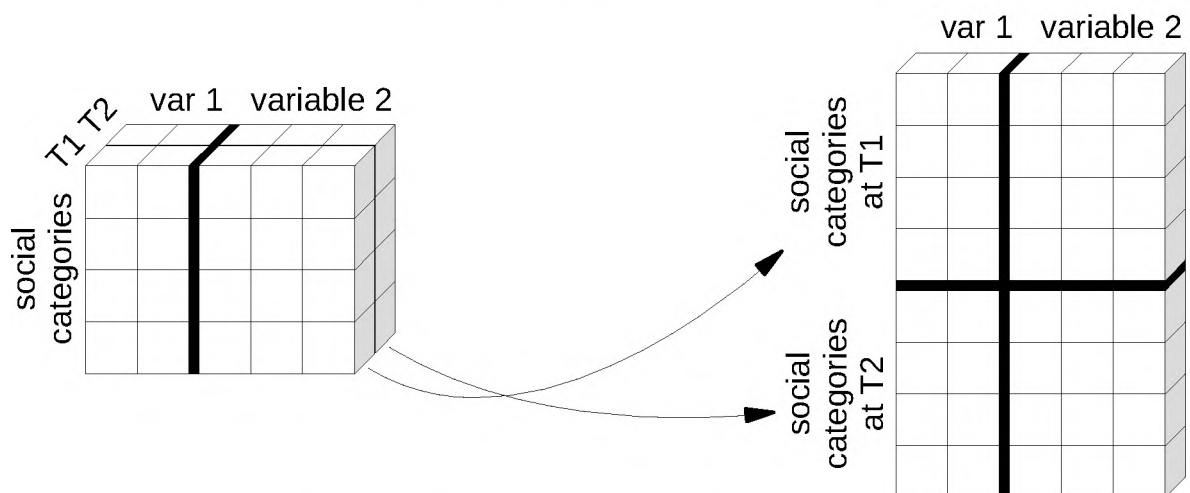


Figure 5: constructing a LONG matrix

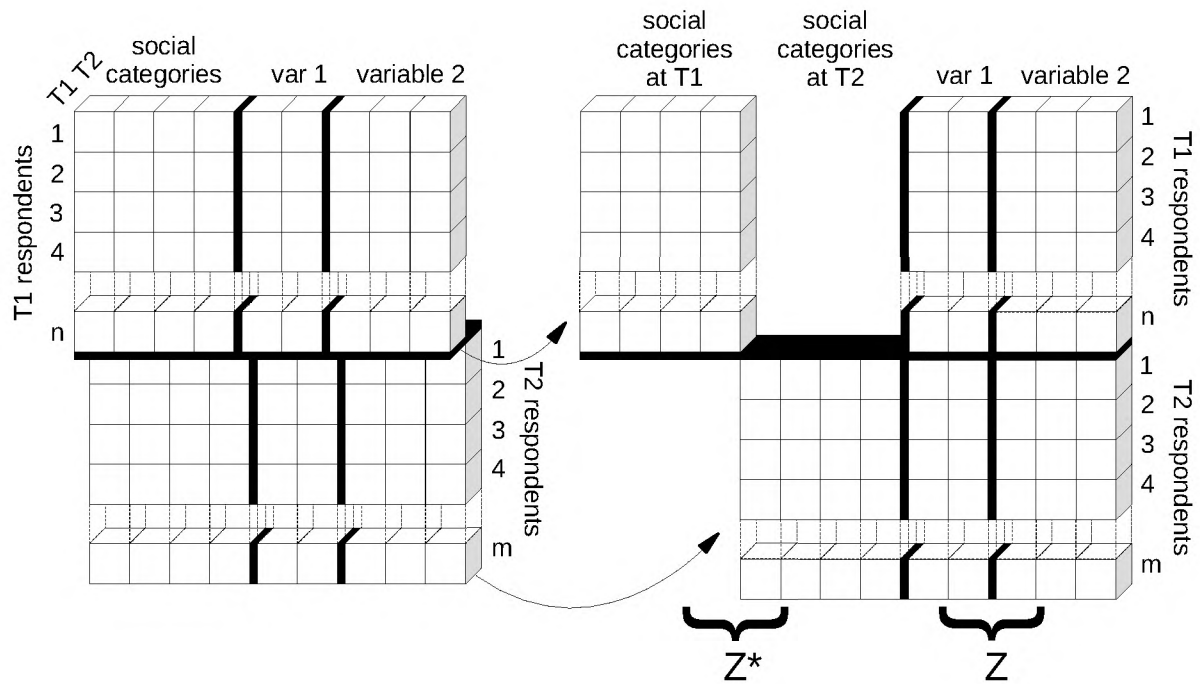


Figure 6: Constructing a LONG indicator matrix

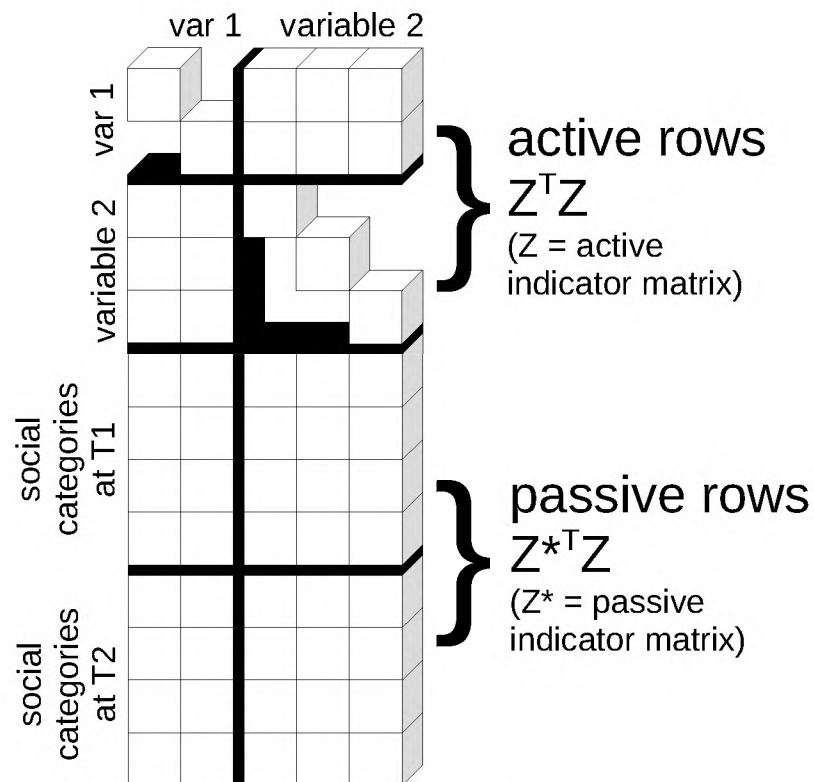


Figure 7: LONG Burt matrix

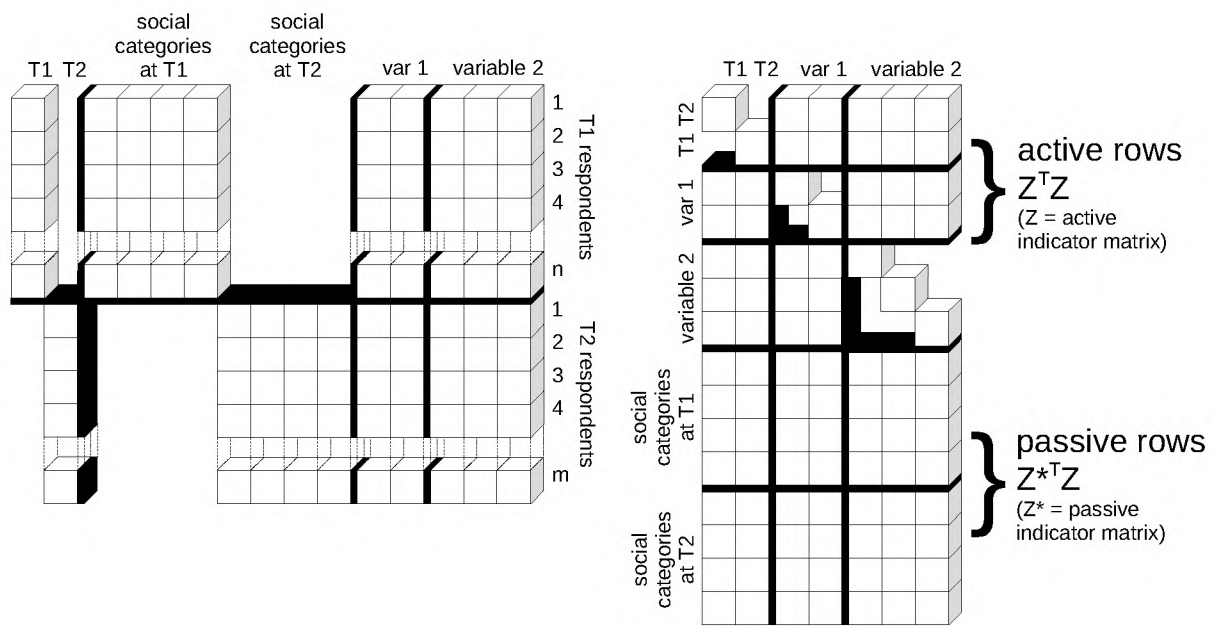


Figure 8: Double-time LONG indicator and Burt matrix

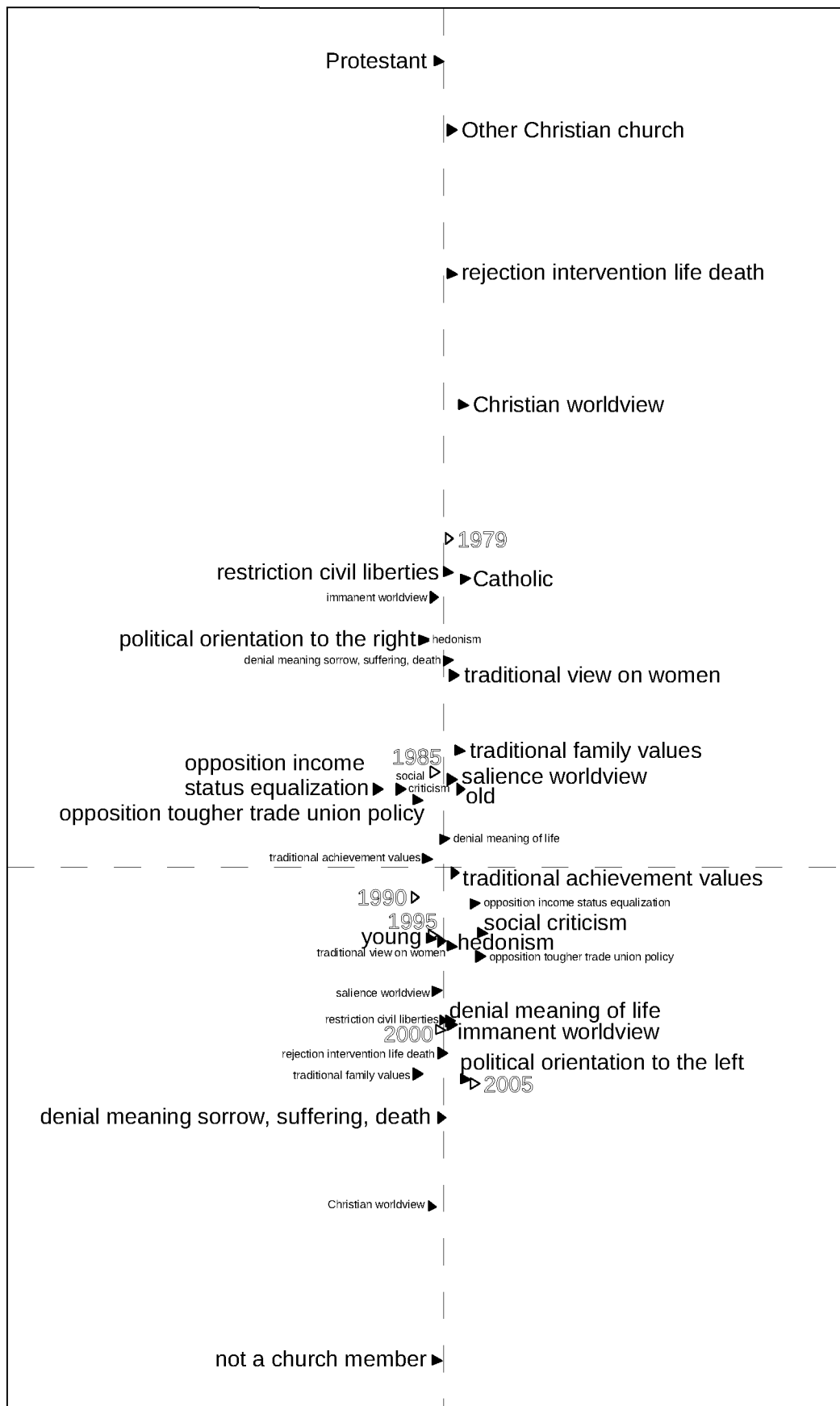


Figure 9: Changes in Dutch society (dimensions 1 and 2)

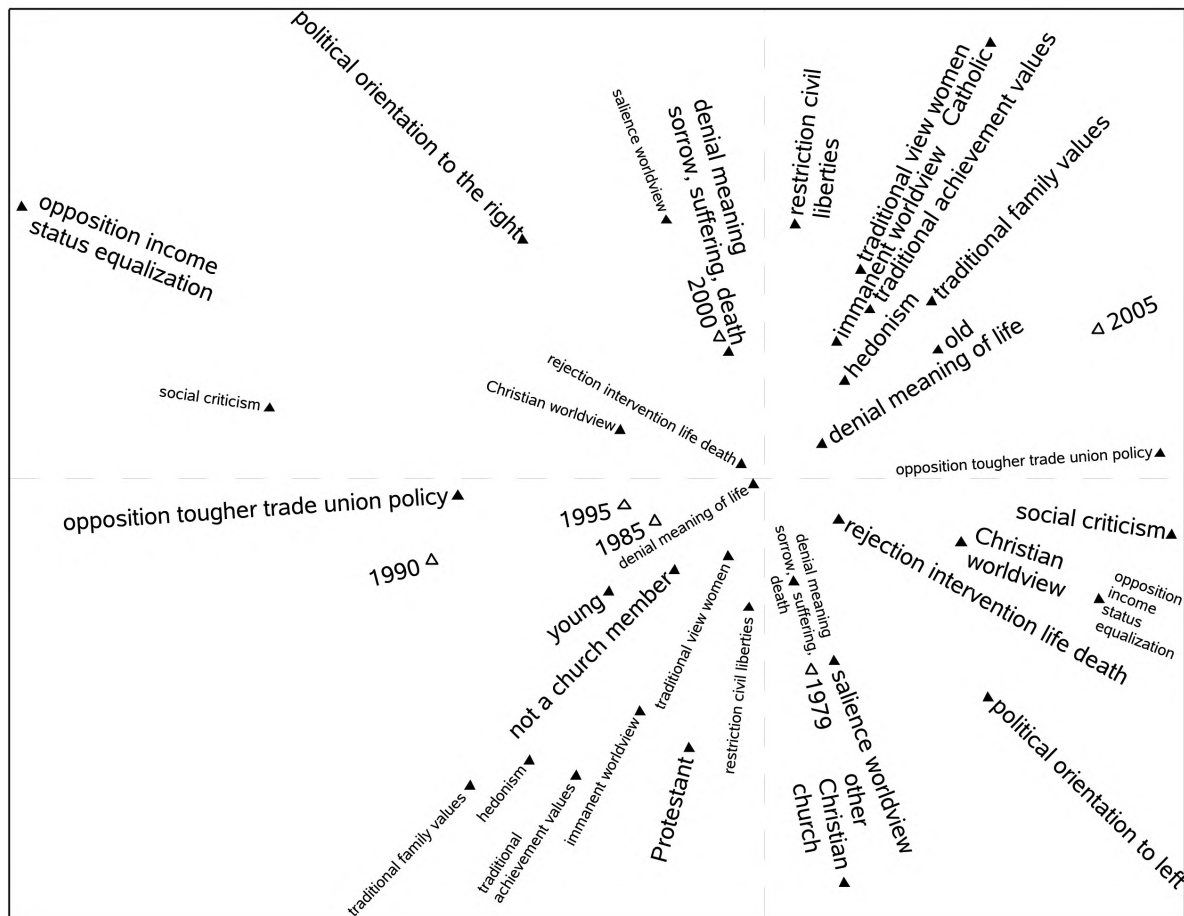


Figure 10: Changes in Dutch society (dimensions 2 and 3)



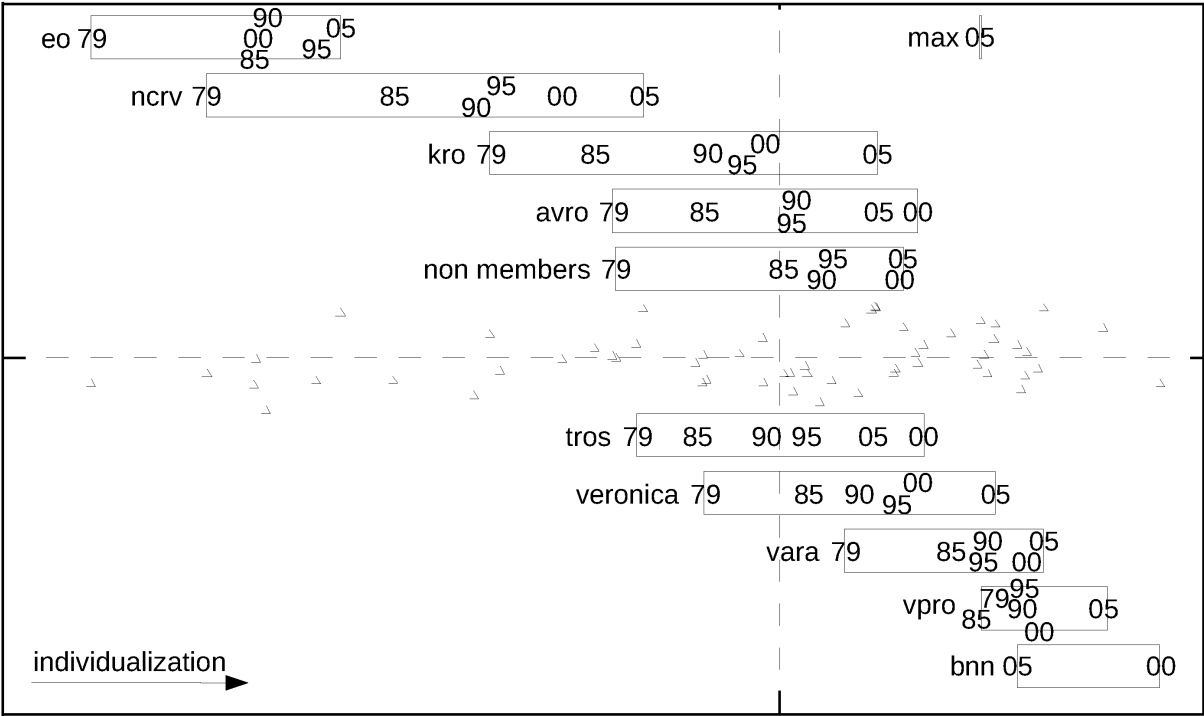


Figure 11: Changes in membership broadcasting associations (dimension 1)

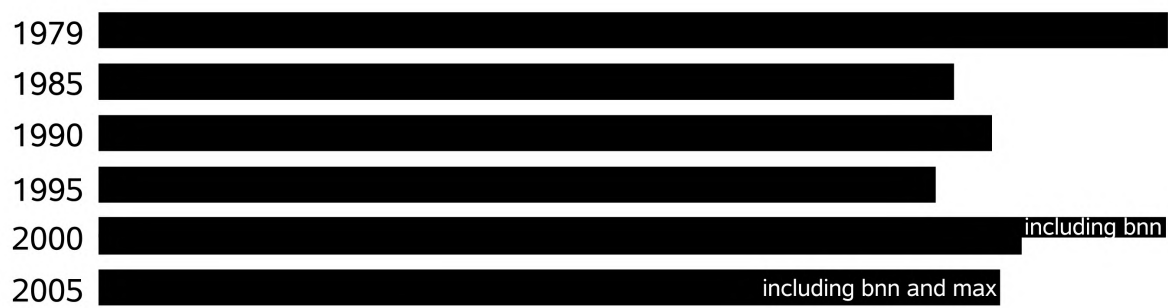


Figure 12: Variation in individualization of membership broadcasting associations

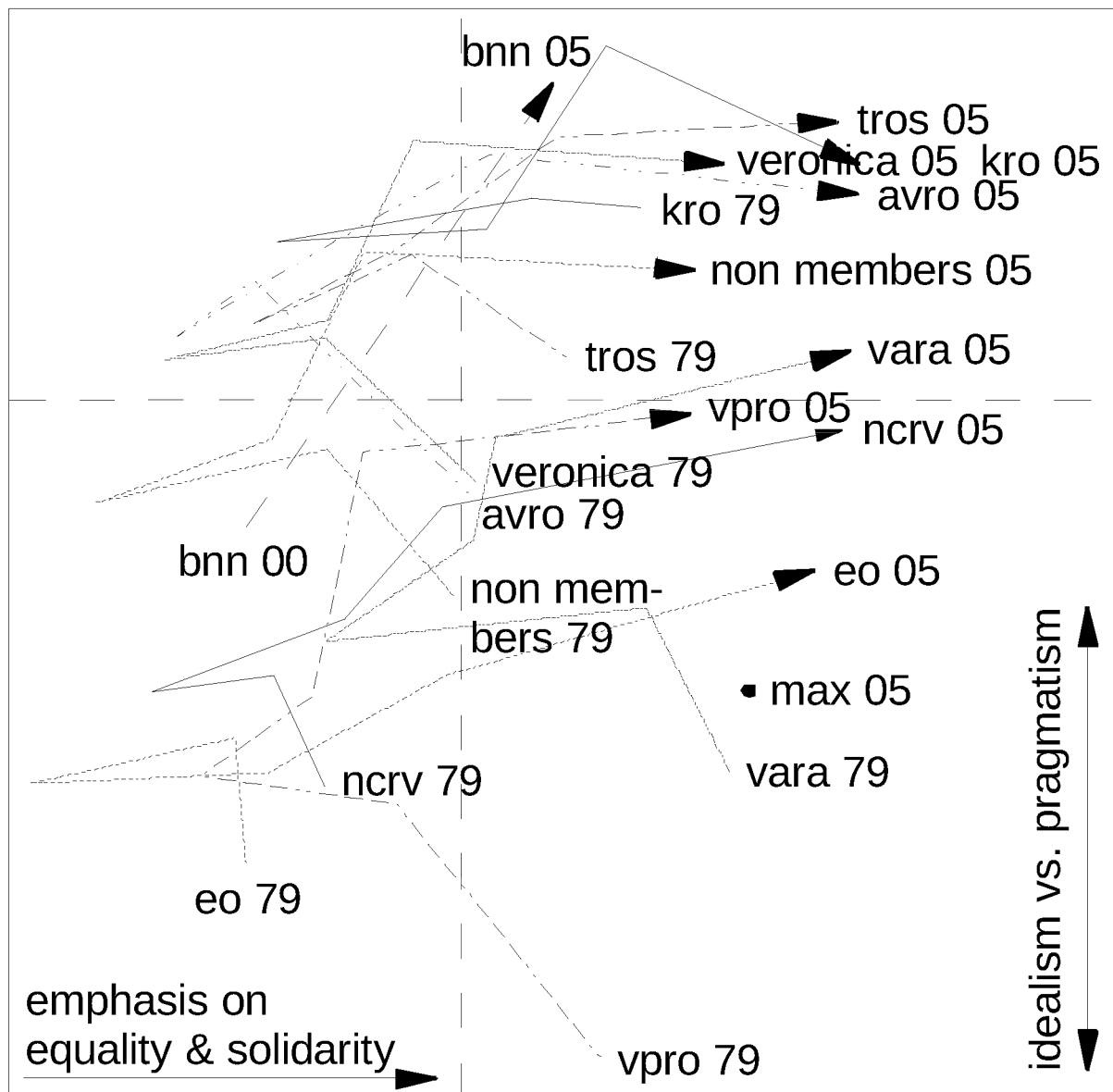


Figure 13: Changes in membership broadcasting associations  
(dimensions 2 & 3)